



AF/1745
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UNITED STATES PATENT AND TRADEMARK OFFICE

Appellant: Foster
Serial No.: 09/334,974
Filed: 06/17/1999
Group Art Unit: 1745
Examiner: Cantelmo
Title: Process for Applying Protective and Decorative Coating on an Article

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MAILSTOP APPEAL BRIEF

P.O. Box 1450

Commissioner of Patents

Alexandria, VA 22131-1450

APPEAL BRIEF

Dear Sir:

Subsequent to the filing of the Notice of Appeal on September 2, 2003, Appellant hereby submits its brief. The Commissioner is authorized to charge Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds, P.C., \$750 for the appeal brief fee (\$330) and a two-month extension of time (\$420). Any additional fees or credits may be charged or applied to Deposit Account No. 50-1482 in the name of Carlson, Gaskey & Olds, P.C.

REAL PARTY IN INTEREST

The real party in interest is Masco Corporation of Indiana, the assignee of the entire right and interest in this Application.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences.

STATUS OF CLAIMS

Claims 1, 2, 4, 5, 7-24, 26-36 and 65-67 stand finally rejected under 103(a).

01/07/2004 MAHMED1 00000033 501482 09334974

01 FC:1402 330.00 DA

01/07/2004 MAHMED1 00000033 501482 09334974

02 FC:1252 420.00 DA

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF THE INVENTION

As shown in Figures 1 and 6, this invention relates to a process of depositing a multi layer coating on an article surface. The process includes depositing a metal or metal alloy layer on a surface by electroplating and subjecting the surface to pulses of air to dry and clean the electroplated surface. A layer comprising a material selected from the group consisting of refractory metal, refractory metal alloy, refractory metal compound, and refractory metal alloy compound is deposited by physical vapor deposition on the electroplated layer (page 4, lines 10-16). The refractory metal compound and refractory metal alloy compound is selected from the group consisting of nitrides, carbides, carbonitrides, oxides and the reaction products of the refractory metal, oxygen and nitrogen (page 12, lines 12 to 25). A problem with prior cleaning methods, including nitrogen drying and hand drying, is that they are both expensive and laborious. The method of the present invention is both cost effective and less laborious. This basic process is set forth in claim 1.

Claims 7 and 26 depend on claims 1 and 22, respectively, and add that the refractory metal compound or refractory metal alloy compound is selected from nitrides, oxides and the reaction products of the refractory metal, oxygen and nitrogen.

Claim 65 depends on claim 1 and adds that the step of drying the article surface occurs between 2 minutes and 5 minutes. Finally, claim 66 depends on claim 1 and adds that the step of subjecting the article surface to pulses of air atomizes water droplets on the article surface.

ISSUES

1. Is the final rejection of claims 1, 2, 4, 7-9, 21-23, 26-28 and 65-67 under 35 U.S.C. 103(a) proper over the combined references of U.S. Patent No. 5,413,874 to Moysan in view of the European Patent Application?

2. Is the final rejection of claims 1, 2, 4, 5, 7-9, 21-24, 26-36 and 65-67 under 35 U.S.C. 103(a) proper over the combined references of U.S. Patent No. 5,922,478 to Welty in view of the European Patent Application?
3. Is the final rejection of claims 10-20 under 35 U.S.C. 103(a) proper over the combined references of U.S. Patent No. 5,922,478 to Welty in view of the European Patent Application and further in view of U.S. Patent No. 5,558,759 to Pudem?

GROUPINGS OF CLAIMS

- A. The rejection of Claims 1, 2, 4, 7-9, 21-23, 26-28 and 65-67 is contested.
- B. The rejection of Claims 7 and 26 is separately contested, that is, the rejection of claims 7 and 26 does not stand or fall with the rejection of the other claims.
- C. The rejection of Claim 65 is separately contested, that is, the rejection of claim 65 does not stand or fall with the rejection of the other claims.
- D. The rejection of Claim 66 is separately contested, that is, the rejection of claim 66 does not stand or fall with the rejection of the other claims.
- E. The rejection of Claims 1, 2, 4, 5, 7-9, 21-24, 26-36 and 65-67 is contested.
- F. The rejection of Claim 65 is separately contested, that is, the rejection of claim 65 does not stand or fall with the rejection of the other claims.
- G. The rejection of Claim 66 is separately contested, that is, the rejection of claim 66 does not stand or fall with the rejection of the other claims.
- H. The rejection of Claims 10-20 is contested.

PATENTABILITY ARGUMENTS

- A. The rejection of Claims 1, 2, 4, 7-9, 21-23, 26-28 and 65-67 under 35 U.S.C. 103 (a) is improper.**

The Examiner finally rejected Claims 1, 2, 4, 7-9, 21-23, 26-28 and 65-67 as being obvious over Moysan (U.S. Patent No. 5,413,874) in view of the European Patent Application (EP 0486711). These claims include the features of depositing a metal or metal alloy layer on a surface by electroplating and subjecting the article surface to pulses of air to dry and clean the

electroplated surface. A layer comprising a material selected from the group consisting of refractory metal, refractory metal alloy, refractory metal compound, and refractory metal alloy compound is deposited by physical vapor deposition on the electroplated layer.

The Examiner argues that Moysan shows a substrate 12 having an electroplated nickel layer 13 and a layer of refractory metal 22 deposited by physical vapor deposition (column 4, lines 18 to 22). A layer of refractory metal compound 24 is over the layer of refractory metal 22. The Examiner acknowledges on page 4 of the Final Office Action that Moysan does not disclose the step of subjecting the article with the electroplated nickel layer 13 to pulses of air to dry and clean the electroplated article. The Examiner asserts the European Patent Application shows an apparatus for blowing a liquid from an article by employing pulsating compressed air jets. The Examiner contends it would be obvious to employ pulsating air jets as suggested by the European Patent Application in Moysan, and therefore Appellant's claims are obvious. Appellant respectfully disagrees.

The present invention is patentable and strikingly different from the combination of Moysan and the European Patent Application. The claimed invention is directed to a process of depositing a multi-layer coating including the step of:

... subjecting said article surface having said at least one electroplated layer thereon to pulses of air to dry and clean said electroplated article surface...

[See Claim 1]. Claims 1, 2, 4, 5, 7-24, 26-36 and 65-67 of the present invention all share this same or similar feature. [See Claims 1, 2, 4, 5, 7-24, 26-36 and 65-67].

First, the European Patent Application in non-analogous art to Appellant's invention and to Moysan. Second, there is no motivation or suggestion to modify Moysan with the European Patent Application. Finally, the references, even if properly combined, do not disclose, suggest, or teach all of the claimed features. Each of these arguments will be discussed in greater detail below.

"In order to rely on a reference as a basis for rejection of an Applicant's invention, the reference must either be in the field of Applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). The European Patent Application is not analogous art to Moysan or to Appellant's claimed invention.

The European Patent Application is not in Moysan or Appellant's field and is not reasonably pertinent to the particular problem that the Appellant has solved. Moysan is directed to an article having a decorative and protective multilayer coating. The Appellant's invention is directed toward a process for applying a protective and decorative coating on an article. The European Patent Application is directed towards a process for removing liquid from a surface for collection. Thus, the European Patent Application's field is related to a process for removing and collecting liquids, while Moysan and Appellant's field concern coatings applied on an article. The European Patent Applications includes no suggestion to apply additional layers over the electroplated object after removal of the liquid.

Additionally, the European Patent Application is not reasonably pertinent to the Appellant's particular problem. A reference is reasonably pertinent if, even though it may be in a different field of endeavor, it logically would have commended itself to an inventor's attention in considering his problem because of the matter with which it deals. In re Clay, 966 F. 2d 656, 659, 23 USPQ2d 1058, 1061 (Fed. Cir. 1992). As discussed above, the European Patent Application is clearly not within the field of coatings, which is the subject to which Appellant's invention is directed. Nothing in the European Patent Application suggests applying a coating on the electroplated surface.

Moreover, even considering, arguendo, the European Patent Application to be analogous art, the mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. There simply is no teaching, suggestion, or incentive in either of the applied references that would have led one of ordinary skill in the art to modify the Moysan multilayer coating in the manner proposed by the Examiner.

The Examiner argues on page 5 of the Final Office Action that it would have been obvious to one having ordinary skill in the art to modify the teachings of Moysan by incorporating the pulse air process of the European Patent Application to provide Moysan with “means to remove and recover excess electrolytes on the surface of the article and also to provide a ‘spot-free’ dryness.” This is clearly a use of hindsight reconstruction. It is impermissible to engage in hindsight reconstruction of the claimed invention, using the Appellant’s structure as a template and selecting elements from the references to fill the gaps. The references themselves must provide some teaching whereby the Appellant’s combination would have been obvious. In re Gorman, 933 F.2d 982, 986, 18USPQ2d 1885, 1888 (Fed. Cir. 1991). There simply is no suggestion in the references, or in the prior art as a whole, that suggests the desirability of making the combination.

Additionally, there is no suggestion in Moysan to pulsate air jets to clean and dry the electroplated nickel layer 13. Moysan discloses that the electroplated surface is sputter cleaned to remove contaminants from its surface by applying power to cathodes to achieve a current flow (column 6, lines 52 to 59). The electroplated surface can also be cleaned by a low pressure etch process by applying a negative D.C. current to the cathodes to achieve a current flow (column 6, lines 60 to 68). Moysan teaches only these two methods of cleaning an electroplated surface and includes no suggestion to employ any other methods of cleaning and drying the electroplated surface.

To employ pulses of air in addition to these cleaning methods would add additional expense. There is no suggestion in Moysan to pulsate air jets to clean and dry the electroplated surface.

Finally, assuming that the combination of Moysan and the European Patent Application is proper, the references taken together do not disclose, suggest, or teach all of the claimed features. The European Patent Application teaches using compressed air to blow a liquid or electrolytes from a surface of an object 2 and then collecting the electrolytes for recycling (page 3, second to last paragraph of translation). In the European Patent Application, the compressed air does not clean and dry the surface of the object 2 as in Appellant’s claimed invention, but rather the compressed air only pushes the liquid electrolytes off the object 2 for collection. The European Patent Application even discloses that after the electrolytes are removed, a very thin moisture layer remains on the object 2 that requires a further processing step for removal (page 4, 5th paragraph of the translation). That is, a further process is then needed to dry the object 2. The European Patent Application does not teach

cleaning and drying the object 2 with compressed air, but rather only teaches a method of collecting liquid and electrolytes. The combination of these references do not teach the claimed invention, and Appellant's claimed invention is not obvious.

Additionally, subjecting an electroplated surface with pulses of air to dry and clean the electroplated surface as claimed by Appellant provides many additional benefits and advantages over the prior art and solves many problems. As disclosed on pages 1 and 2 of Appellant's specification, an electroplated surface is cleaned to remove water spots or surface defects caused by the electroplating process that can be visible through the thin vapor deposited layer. The prior cleaning methods, such as nitrogen drying and hand drying, are both expensive and laborious. By utilizing pulses of air to clean and dry an electroplated surface, these problems are overcome. Appellant's claimed invention overcomes the problems of the prior art, and Appellant's claims are not obvious.

For the many reasons set forth above, the rejection of claims 1, 2, 4, 7-9, 21-23, 26-28 and 65-67 under 35 U.S.C. 103(a) is improper and must be withdrawn.

B. The rejection of Claims 7 and 26 under 35 U.S.C. 103 (a) is improper.

The rejection of Claims 7 and 26 is separately contested from the rejection of Claims 1 et al. Claims 7 and 26 recite depositing an electroplated metal or metal alloy layer on an article, pulsing air on the electroplated surface, and the depositing by physical vapor deposition at least one of refractory metal compound and refractory metal alloy compound.

Claims 7 and 26 are not obvious in view of the combination of Moysan and the European Patent Application. The references taken together do not disclose, suggest, or teach all of the claimed features. Moysan does not disclose that the refractory metal compound layer 24 is deposited by physical vapor deposition as claimed. Instead, Moysan discloses that the refractory metal compound layer 24 is deposited by either vacuum coating or reactive sputter ion plating (column 5, lines 5 to 14). Therefore, the combination of Moysan and the European Patent Application does not disclose or suggest a refractory metal compound layer or a refractory metal alloy compound layer deposited by physical vapor deposition as claimed in Claims 7 and 26. Claims 7 and 26 are not obvious in view of the combination of Moysan and the European Patent Application, and a rejection based on obviousness is improper for Claim 7.

C. The rejection of Claim 65 under 35 U.S.C. 103 (a) is improper.

The rejection of Claim 65 is separately contested from the rejection of Claims 1 et al. Claim 65 recites that the step of drying the article occurs between 2 minutes and 5 minutes.

Claim 65 is not obvious in view of the combination of Moysan and the European Patent Application. The references taken together do not disclose, suggest, or teach all of the claimed features. The European Patent Application discloses that a pulse of compressed air is emitted from the respective air discharge opening every 0.4 seconds (page 4, paragraph 2). However, there is no suggestion in the European Patent Application to dry the article between 2 and 5 minutes. Moysan does not disclose the step of employing pluses of air to dry and clean an electroplated surface. Therefore, the combination of Moysan and the European Patent Application does not disclose, suggest or teach the claimed features. Claim 65 is not obvious.

D. The rejection of Claim 66 under 35 U.S.C. 103 (a) is improper.

The rejection of Claim 66 is separately contested from the rejection of Claims 1 et al. Claim 66 recites that the step of subjecting the article surface to pulses of air atomizes water droplets on the article surface.

Claim 66 is not obvious in view of the combination of Moysan and the European Patent Application. The references taken together do not disclose, suggest, or teach all of the claimed features. The Examiner states that the European Patent Application fails to explicitly disclose this function, but it would be expected. The European Patent Application does not disclose or suggest this feature. The European Patent Application discloses that the liquid is blown away from the surface of the objects 2 by compressed air pulses to collect at the bottom of the container 1 and then the liquid flows through a discharge container (page 5, paragraph 6). The European Patent Application does not disclose or suggest atomizing the water, but rather discloses using the compressed air pulses to blow the liquid off into a discharge container for collection. Moysan does not disclose the step of employing pluses of air to dry and lean an electroplated surface. Therefore, the combination of Moysan and the European Patent Application does not disclose, suggest or teach the claimed features. Claim 66 is not obvious.

E. The rejection of Claims 1, 2, 4, 5, 7-9, 21-24, 26-36 and 65-67 under 35 U.S.C. 103 (a) is improper.

The Examiner finally rejected Claims 1, 2, 4, 5, 7-9, 21-24, 26-36 and 65-67 as being obvious over Welty (U.S. Patent No. 5,922,478) in view of the European Patent Application (EP 0486711). These claims include the features of depositing a metal or metal alloy layer on a surface by electroplating and subjecting the article surface to pulses of air to dry and clean the electroplated surface. A layer comprising a material selected from the group consisting of refractory metal, refractory metal alloy, refractory metal compound, and refractory metal alloy compound is deposited by physical vapor deposition on the electroplated layer.

The Examiner argues that Welty shows a substrate 12 having an electroplate nickel layer 14, 16 and a layer of refractory metal or metal alloy 22 and a layer of refractory metal compound or refractory metal alloy compound 32 deposited by physical vapor deposition (column 4, lines 11 to 15 and column 5, lines 63 to 67). The Examiner acknowledges on page 12 of the Final Office Action that Welty does not disclose the step of subjecting the article with the electroplated nickel layer 14, 16 to pulses of air to dry and clean the electroplated article. The Examiner asserts the European Patent Application shows an apparatus for blowing a liquid from an article by employing pulsating compressed air jets. The Examiner contends it would be obvious to employ pulsating air jets as suggested by the European Patent Application in Welty, and therefore Appellant's claims are obvious. Appellant respectfully disagrees.

First, the European Patent Application is non-analogous art to Appellant's invention and to Welty. Second, there is no motivation or suggestion to modify Welty with the European Patent Application. Finally, the references, even if properly combined, do not disclose, suggest, or teach all of the claimed features. Each of these arguments will be discussed in greater detail below.

"In order to rely on a reference as a basis for rejection of an Applicant's invention, the reference must either be in the field of applicant's endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned." In re Oetiker, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). The European Patent Application is not analogous art to Welty or to Appellant's claimed invention.

The European Patent Application is not in Welty or Appellant's field and is not reasonably pertinent to the particular problem that the Appellant has solved. Welty is directed to an article having a decorative and protective multilayer coating. The Appellant's invention is directed toward a process for applying a protective and decorative coating on an article. The European Patent Application is directed towards a process for removing liquid from a surface for collection of the liquid. Thus, the European Patent Application's field is related to a process for removing and collecting liquids, while Welty and Appellant's field concern coatings applied on an article. The European Patent Applications includes no suggestion to apply additional layers over the electroplated object after removal of the liquid.

Additionally, the European Patent Application is not reasonably pertinent to the Appellant's particular problem. A reference is reasonably pertinent if, even though it may be in a different field of endeavor, it logically would have commended itself to an inventor's attention in considering his problem because of the matter with which it deals. In re Clay, 966 F. 2d 656, 659, 23 USPQ2d 1058, 1061 (Fed. Cir. 1992). As discussed above, the European Patent Application is clearly not within the field of coatings, which is the subject to which Appellant's invention is directed. Nothing in the European Patent Application suggests applying a coating on the electroplated surface.

Moreover, even considering, arguendo, the European Patent Application to be analogous art, the mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. There simply is no teaching, suggestion, or incentive in either of the applied references that would have led one of ordinary skill in the art to modify the Welty multilayer coating in the manner proposed by the Examiner.

The Examiner argues on page 13 of the Final Office Action it would have been obvious to one having ordinary skill in the art to modify the teachings of Welty by incorporating the pulse air process of the European Patent Application to provide Welty with “means to remove and recover excess electrolytes on the surface of the article and also to provide a ‘spot-free’ dryness.” This is clearly a use of hindsight reconstruction. It is impermissible to engage in hindsight reconstruction of the claimed invention, using the Appellant’s structure as a template and selecting elements from the references to fill the gaps. The references themselves must provide some teaching whereby the appellant’s combination would have been obvious. In re Gorman, 933 F.2d 982, 986, 18USPQ2d 1885, 1888 (Fed. Cir. 1991). There simply is no suggestion in the references, or in the prior art as a whole, that suggests the desirability of making the combination.

Additionally, there is no suggestion in Welty to pulsate air jets to clean and dry the electroplated nickel layer 13. Welty discloses that the electroplated surface is high-bias arch plasma cleaned to remove contaminants from its surface by applying a negative bias voltage to the surface (column 8, lines 32 to 37). Welty teaches only this one method of cleaning an electroplated surface and includes no suggestion to employ any other methods of cleaning and drying the electroplated surface. To employ pulses of air in addition to this cleaning method would add additional expense. There is no suggestion in Welty to pulsate air jets to clean and dry the electroplated surface.

Finally, assuming that the combination of Welty and the European Patent Application is proper, the references taken together do not disclose, suggest, or teach all of the claimed features. The European Patent Application teaches using compressed air to blow electrolytes from a surface of an object 2 and then collecting the electrolytes for recycling (page 3, second to last paragraph of translation). In the European Patent Application, the compressed air does not clean and dry the surface of the object 2 as in Appellant’s claimed invention, but rather the compressed air only pushes the electrolytes off the object 2 for collection. The European Patent Application even discloses that after the electrolytes are removed, a very thin moisture layer remains on the object 2 that requires a further processing step for removal (page 4, 5th paragraph of the translation). That is, a further process is then needed to dry the object 2. The European Patent Application does not teach cleaning and drying the object 2 with compressed air, but rather only teaches a method of collecting liquid and

electrolytes. The combination of these references do not teach the claimed invention, and Appellant's claimed invention is not obvious.

Additionally, subjecting an electroplated surface with pulses of air to dry and clean the electroplated surface as claimed by Appellant provides many additional benefits and advantages over the prior art and solves many problems. As disclosed on pages 1 and 2 of Appellant's specification, an electroplated surface is cleaned to remove water spots or surface defects caused by the electroplating process that can be visible through the thin vapor deposited layer. The prior cleaning methods, such as nitrogen drying and hand drying, are both expensive and laborious. By utilizing pulses of air to clean and dry an electroplated surface, these problems are overcome. Appellant's claimed invention overcomes the problems of the prior art, and Appellant's claims are not obvious.

For the many reasons set forth above, the rejection of claims, 2, 4, 5, 7-9, 21-24, 26-36 and 65-67 under 35 U.S.C. 103(a) is improper and must be withdrawn.

F. The rejection of Claim 65 under 35 U.S.C. 103 (a) is improper.

The rejection of Claim 65 is separately contested from the rejection of Claims 1 et al. Claim 65 recites that the step of drying the article occurs between 2 minutes and 5 minutes.

Claim 65 is not obvious in view of the combination of Welty and the European Patent Application. The references taken together do not disclose, suggest, or teach all of the claimed features. The European Patent Application discloses that a pulse of compressed air is emitted from the respective air discharge opening every 0.4 seconds (page 4, paragraph 2). However, there is no suggestion in the European Patent Application to dry the article between 2 and 5 minutes. Welty does not disclose the step of employing pulses of air to dry and clean an electroplated surface. Therefore, the combination of Welty and the European Patent Application does not disclose, suggest or teach the claimed features. Claim 65 is not obvious.

G. The rejection of Claim 66 under 35 U.S.C. 103 (a) is improper.

The rejection of Claim 66 is separately contested from the rejection of Claims 1 et al. Claim 66 recites that the step of subjecting the article surface to pulses of air atomizes water droplets on the article surface.

Claim 66 is not obvious in view of the combination of Welty and the European Patent Application. The references taken together do not disclose, suggest, or teach all of the claimed features. The Examiner states that the European Patent Application fails to explicitly disclose this function, but it would be expected. The European Patent Application does not disclose or suggest this feature. The European Patent Application discloses that the liquid is blown away from the surface of the objects 2 by compressed air pulses to collect at the bottom of the container 1 and then the liquid flows through a discharge container (page 5, paragraph 6). The European Patent Application does not disclose or suggest atomizing the water, but rather discloses using the compressed air pulses to blow the liquid off into a discharge container for collection. Welty does not disclose the step of employing pluses of air to dry and lean an electroplated surface, and therefore also does not suggest atomized water droplets. Therefore, the combination of Welty and the European Patent Application does not disclose, suggest or teach the claimed features. Claim 66 is not obvious.

H. The rejection of Claims 10-20 under 35 U.S.C. 103 (a) is improper.

The Examiner finally rejected Claims 10-20 as being obvious over Welty in view of the European Patent Application and further in view of Pudem (U.S. Patent No. 5,558,759). Claim 10 recites electroplating a copper layer on the article, electroplating a nickel layer on the copper layer, and electroplating a chrome layer directly on the nickel layer.

Pudem teaches a finishing process for a base metal substrate including the steps of striking a component with copper, electroplating the component with nickel, electroplating the component with brass, and then dipping the component in a chromate bath. The Examiner contends it would be obvious to electroplate copper on a portion of the article because of Pudem, and therefore Appellant's claims are obvious. Appellant respectfully disagrees.

Claim 66 is not obvious in view of the combination of Welty, the European Patent Application, and Pudem. The references taken together do not disclose, suggest, or teach all of the claimed features. In Pudem, the electroplated brass layer is located between the nickel layer and the chrome layer. That is, Pudem teaches a brass layer applied directly on the nickel layer. In Appellant's claims 10-20, the chrome layer is electroplated directly on the nickel layer. The

combination of Moysan, the European Patent application and Pudem does not suggest a nickel layer directly electroplated on a copper layer as required by claims 10-20. None of the references disclose or suggest a chrome layer electroplated directly on a nickel layer as claimed, and therefore the combination does not disclose or suggestion claims 10-20. Claims 10-20 are not obvious.

CLOSING

For the reasons set forth above, the rejection of all claims is improper and should be reversed. Appellant respectfully requests such an action.

Respectfully Submitted,

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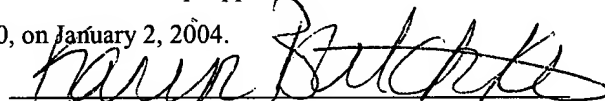
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Dated: January 2, 2004

CERTIFICATE OF MAILING

I hereby certify that this appeal brief (in triplicate) is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Mail Stop Appeal Brief – Patent, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on January 2, 2004.


Karin Butchko

CLAIM APPENDIX

1. A process of depositing a multi layer coating on at least a portion of an article surface comprising:

depositing by electroplating at least one metal or metal alloy containing layer on at least a portion of said article surface;

subjecting said article surface having said at least one electroplated layer thereon to pulses of air to dry and clean said electroplated article surface; and

depositing by physical vapor deposition on at least a portion of said dry and clean electroplated layer at least one layer comprising a material selected from the group consisting of refractory metal, refractory metal alloy, refractory metal compound, and refractory metal alloy compound on at least a portion of said electroplated layer, wherein said refractory metal compound is selected from the group consisting of nitrides, carbides, carbonitrides, oxides and reaction products of said refractory metal, oxygen and nitrogen, and wherein said refractory metal alloy compound is selected from the group consisting of nitrides, carbides, carbonitrides, oxides and reaction products of said refractory metal alloy, oxygen and nitrogen.

2. The process of claim 1 wherein said electroplating comprises electroplating at least one layer comprising a material selected from copper, nickel and chrome on at least a portion of said article surface.

4. The process of claim 2 wherein said refractory metal is selected from zirconium and titanium and said refractory metal alloy is zirconium-titanium alloy.

5. The process of claim 4 wherein said refractory metal is zirconium and said refractory metal alloy is zirconium-titanium alloy.

7. The process of claim 1 wherein said refractory metal compound is selected from nitrides, oxides and reaction products of refractory metal, oxygen and nitrogen, and said refractory metal alloy compound is selected from nitrides, oxides and reaction products of refractory metal alloy, oxygen and nitrogen.

8. The process of claim 7 wherein said refractory metal compound is selected from zirconium nitride, zirconium oxide, reaction products of zirconium, oxygen and nitrogen, titanium nitride, titanium oxide and reaction products of titanium, oxygen and nitrogen, and said refractory metal alloy compound is selected from zirconium-titanium alloy nitride, zirconium-titanium alloy oxide and reaction products of zirconium-titanium alloy, oxygen and nitrogen.

9. The process of claim 8 wherein said refractory metal compound is selected from zirconium oxide, zirconium nitride and reaction products of zirconium, oxygen and nitrogen, and said refractory metal alloy compound is selected from zirconium-titanium alloy nitride, zirconium-titanium alloy oxide and reaction products of zirconium-titanium alloy, oxygen and nitrogen.

10. The process of claim 1 wherein said electroplating comprises electroplating at least one layer comprised of copper on said at least a portion of the surface of said article to provide at least one electroplated copper layer, electroplating at least one layer comprised of nickel on said at least one electroplated copper layer to provide at least one electroplated nickel layer, and electroplating at least one layer comprised of chrome directly on said at least one electroplated nickel layer.

11. The process of claim 10 wherein said at least one layer selected from refractory metal and refractory metal alloy is deposited by physical vapor deposition on at least a portion of said electroplated chrome layer.

12. The process of claim 11 wherein said refractory metal is selected from zirconium and titanium and wherein said refractory metal alloy is zirconium-titanium alloy.
13. The process of claim 12 wherein said refractory metal is zirconium and said refractory metal alloy is zirconium-titanium alloy.
14. The process of claim 13 wherein a sandwich coating comprised of alternating layers of zirconium or zirconium-titanium alloy, and zirconium nitride or zirconium-titanium alloy nitride is deposited by physical vapor deposition over said zirconium or zirconium-titanium alloy layer.
15. The process of claim 14 wherein a zirconium nitride or zirconium-titanium alloy nitride layer is deposited by physical vapor deposition over said sandwich layer.
16. The process of claim 15 wherein a zirconium oxide or zirconium-titanium oxide layer is deposited by physical vapor deposition over said zirconium nitride layer or zirconium-titanium alloy nitride layer.
17. The process of claim 15 wherein a layer comprised of the reaction products of zirconium or zirconium-titanium alloy, oxygen and nitrogen is deposited by physical vapor deposition over said zirconium nitride layer or said zirconium-titanium alloy nitride layer.
18. The process of claim 13 wherein a layer comprised of zirconium nitride or zirconium-titanium alloy nitride is deposited by physical vapor deposition over said zirconium or zirconium-titanium alloy layer.
19. The process of claim 18 wherein a layer comprised of zirconium oxide or zirconium-titanium alloy oxide is deposited by physical vapor deposition over said zirconium nitride or zirconium-titanium alloy nitride layer.

20. The process of claim 18 wherein a layer comprised of the reaction products of zirconium or zirconium-titanium alloy layer, oxygen and nitrogen is deposited by physical vapor deposition over said zirconium nitride or zirconium-titanium alloy nitride layer.
21. The process of claim 1 wherein said electroplating comprises electroplating at least one layer selected from nickel and chrome on said at least a portion of said article surface.
22. The process of claim 21 wherein said at least one layer selected from refractory metal, refractory metal alloy, refractory metal compound and refractory metal alloy compound is deposited by physical vapor deposition on said at least a portion of said at least one electroplated layer.
23. The process of claim 22 wherein said refractory metal is selected from zirconium and titanium, and said refractory metal alloy is zirconium-titanium alloy.
24. The process of claim 23 wherein said refractory metal is zirconium and said refractory metal alloy is zirconium-titanium alloy.
26. The process of claim 22 wherein said refractory metal compound is selected from nitrides, oxides and reaction products of refractory metal, oxygen and nitrogen, and wherein said refractory metal alloy compound is selected from nitrides, oxides and reaction products of refractory metal alloy, oxygen and nitrogen.
27. The process of claim 26 wherein said refractory metal compound is selected from zirconium nitride, zirconium oxide, reaction products of zirconium, oxygen and nitrogen, titanium nitride, titanium oxide, reaction products of titanium, oxygen and nitrogen, and wherein said refractory metal alloy compound is selected from zirconium-titanium alloy nitride, zirconium-titanium alloy oxide, and reaction products of zirconium-titanium alloy, oxygen and nitrogen.

28. The process of claim 27 wherein said refractory metal compound is selected from zirconium oxide, zirconium nitride and reaction products of zirconium, oxygen and nitrogen, and wherein said refractory metal alloy compound is selected from zirconium-titanium alloy nitride, zirconium-titanium alloy oxide, and reaction products of zirconium-titanium alloy, oxygen and nitrogen.

29. The process of claim 1 wherein said electroplating comprises electroplating at least one layer comprised of nickel on at least said portion of the surface of said article to provide at least one electroplated nickel layer, and electroplating at least one layer comprised of chrome directly on said at least one electroplated nickel layer to provide at least one electroplated chrome layer.

30. The process of claim 29 wherein at least one layer selected from refractory metal and refractory metal alloy is deposited by physical vapor deposition on at least a portion of said electroplated chrome layer.

31. The process of claim 30 wherein said refractory metal is selected from zirconium and titanium, and wherein said refractory metal alloy is zirconium-titanium alloy.

32. The process of claim 31 wherein said refractory metal is zirconium, and wherein said refractory metal alloy is zirconium-titanium alloy.

33. The process of claim 32 wherein a sandwich coating comprised of layers comprised of zirconium or zirconium-titanium alloy alternating with layers comprised of zirconium nitride or zirconium-titanium alloy nitride is deposited by physical vapor deposition over said zirconium or zirconium-titanium alloy layer.

34. The process of claim 33 wherein a zirconium nitride or zirconium-titanium alloy nitride layer is deposited by physical vapor deposition over said sandwich layer.

35. The process of claim 34 wherein a zirconium oxide or zirconium-titanium oxide layer is deposited by physical vapor deposition over said zirconium nitride or zirconium-titanium alloy nitride layer.

36. The process of claim 34 wherein a layer comprised of the reaction products of zirconium or zirconium-titanium alloy, oxygen and nitrogen is deposited by physical vapor deposition over said zirconium nitride or zirconium-titanium alloy nitride layer.

65. The process of claim 1 wherein the step of drying said article surface occurs between 2 minutes and 5 minutes.

66. The process of claim 1 wherein the step of subjecting said article surface to pulses of air atomizes water droplets on said article surface.

67. The process of claim 1 wherein one pulse of air is generated for a square centimeter of said article surface.

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